Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellants: LOC et al.

Application No.: 10/813,377

Filing Date: 3/30/2004

For: THERMAL DISTRIBUTION SYSTEM FOR VOLTAGE REGULATOR

Confirmation No.: 4695

Group Art Unit: 2838

Examiner: Rajnikant B. Patel

APPEAL BRIEF

Attorney Docket No.: P18194

PTO Customer Number 28062
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CERTIFICATE OF MAILING UNDER 37 CFR 1.8

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Dated: April 13, 2007 By: Edith Mann

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
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Sir:

Appellants hereby appeal to the Board of Patent Appeals and Interferences from the Non-Final Office Action mailed November 17, 2006 (the "Office Action"), rejecting claims 1 through 7, 10 through 13, and 15 through 19.

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REAL PARTY IN INTEREST

The present application is assigned to INTEL CORPORATION, 2200 Mission College Blvd., Santa Clara, California 95052, U.S.A.

RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known to Appellants, Appellants' legal representative, or assignee, which will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1 through 7, 10 through 13, and 15 through 19 are pending in this application. All pending claims stand rejected and are now being appealed.

STATUS OF AMENDMENTS

No amendments are pending or were filed after the Office Action.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1

The claimed subject matter describes an apparatus that comprises a substrate, a voltage regulator converter and a voltage regulator controller coupled to the voltage regulator converter (Specification, page 2 lines 1 - 6). The voltage regulator converter comprises N phases where N is greater than one and each of the N phases is located in a respective one of N areas of the substrate. (Specification, page 2 lines 14 - 23). A first one of the N phases is to generate more heat than a second one of the N phases, and a first area of the substrate in which the first one of the N phases is located is less

thermally-sensitive than a second area of the substrate in which the second one of the N phases is located. (Specification, page 2 lines 14 - 23).

Claim 10

The claimed subject matter is directed to a method. The method comprises controlling a first one of N phases of a voltage regulator converter to output a first current (Specification, page 2 lines 14 - 17), and controlling a second one of the N phases to output a second current. (Specification, page 2 lines 14 - 17). The first one of the N phases is to generate more heat than the second one of the N phases (Specification, page 2 lines 17 - 19), and a first area of a substrate in which the first one of the N phases is located is less thermally-sensitive than the second area of the substrate in which the second one of the N phases is located (Specification, page 2 lines 19 - 21).

Claim 15

The claimed subject matter is directed to a system comprising, a microprocessor, a motherboard coupled to the microprocessor, a double data rate memory coupled to the microprocessor, and a voltage regulator coupled to the motherboard to provide a voltage to the microprocessor (Specification, page 5 lines 10 - 15). The voltage regulator comprises a voltage regulator converter that comprises N (N>1) phases (Specification, page 5 lines 16 - 19). Each of the N phases is located in a respective one of N areas of the substrate (Specification, page 2 lines 14 - 23). The voltage regulator controller is coupled to the voltage regulator converter (Specification, page 5 lines 19- 21). A first one of the N phases is to generate more heat than a second one of the N phases (Specification, page 2 lines 17 - 19), and a first area of the substrate in which the first one of the N phases is located is less thermally-sensitive than a second area of the substrate in which the second one of the N phases is located (Specification, page 2 lines 19 - 21).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

(1) Claims 1, 10, and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,449,174 ("Elbanhawy") in combination with U.S. Patent No. 4,967,201 ("Rich") and U.S. Patent No. 7,027,944 ("Tabaian").

(2) Claims 1 and 15 are rejected under 35 U.S.C. §112 second paragraph.

ARGUMENT

Appellants raise the following arguments as evidence of clear error in the outstanding rejection of twice-rejected independent claims 1, 10, and 15.

I. THE PENDING CLAIMS ARE NOT INDEFINITE UNDER 35 U.S.C. §112, SECOND PARAGRAPH

The Office Action states that the phrase "[a first one of] the N phases is located is less thermally-sensitive than a second area of the substrate in which the second of the N-phases is located" is indefinite and unclear in light of the specification. Appellants respectfully disagree.

One of ordinary skill in the art would have no trouble understanding the metes and bounds of the above-quoted phrase. More particularly, one of ordinary skill would clearly understand the meaning of the term "thermally-sensitive" as well as the concept of locating phases in areas exhibiting various thermal sensitivity.

The specification is consistent with the plain meaning of the disputed phrase. Appellants submit that, as stated on page 2, lines 14 – 21 of the specification, "[i]n some embodiments, voltage regulator converter 14 comprises two or more phases as is known in the art. Voltage regulator controller 12 may control voltage regulator converter 14 to generate a first current within a first one of the phases and to generate a second current within a second one of the

phases. According to some embodiments, electrical elements of one of the first and second phases may therefore generate less heat than electrical elements of the other one of the first and second phases. The phase that generates less heat may be located in an area of a substrate that is more thermally-sensitive than the area in which the other phase is located."

In view of the foregoing, appellants submit that claims 1 and 15 comply with the second paragraph of 35 U.S.C. § 112.

II. THE PRIOR ART DOES NOT SUPPORT A REJECTION UNDER 35 U.S.C.§103

Independent claim 1 describes an apparatus that comprises a substrate, a voltage regulator converter and a voltage regulator controller coupled to the voltage regulator converter. The voltage regulator converter comprises N phases, where N is greater than one, and each of the N phases is located in a respective one of N areas of the substrate. A first one of the N phases is to generate more heat than a second one of the N phases, and a first area of the substrate in which the first one of the N phases is located is less thermally-sensitive than a second area of the substrate in which the second one of the N phases is located.

However, the prior art is not seen to disclose or to suggest a first one of N phases to generate more heat than a second one of N phases, wherein a first area of a substrate in which the first one of the N phases is located is less thermally-sensitive than a second area of the substrate in which the second one of the N phases is located.

Elbanhawy discloses a multi-phase power supply and, as conceded in the November 17th Non-Final Office Action, Elbanhawy fails to disclose or suggest a first area of a substrate in which a first one of N phases is located and which is less thermally sensitive than a second area of the substrate.

The office action alleges that the Abstract of Rich discloses a first area of the substrate in which "the first one of the N phases is located is less thermally sensitive than a second area of the substrate". The abstract describes thermal conductors located in thermal proximity of selected portions of a microwave signal processing means, a

power condition means, and a control signal processing means to conduct thermal energy away from these means. However, nowhere does the abstract disclose or suggest a thermally sensitive area that is less or more sensitive than any other area, nor does the abstract disclose phases located in thermally sensitive areas. The abstract also fails to disclose or to suggest locating an element that generates a greater amount of heat in a less thermally sensitive area of a substrate and an element that generates a lesser amount of heat in a more thermally sensitive area.

The remaining portions of Rich have been reviewed and are not seen to contain any disclosure or suggestion of a first area of the substrate in which the first one of the N phases is located is less thermally sensitive than a second area of the substrate.

Tabaian describes a circuit for regulating power by sharing power equally amongst all phases of the circuit. However, since each phase of the circuit uses a same amount of power, Tabaian makes no mention of thermal differences among the phases. Accordingly, Tabaian fails to disclose or suggest a first area of a substrate in which a first one of N phases is located and which is less thermally sensitive than a second area of the substrate. In view of the foregoing, claim 1 is believed to be in condition for allowance.

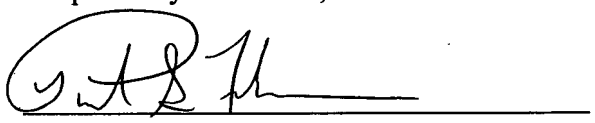
Claims 10 and 15 relate to a method and a system, respectively, in which a first one of N voltage regulator phases is to generate more heat than a second one of N voltage regulator phases, and wherein a first area of a substrate in which the first one N voltage regulator phases is located is less thermally-sensitive than a second area of the substrate in which the second one of the N voltage regulator phases is located. In view of at least the foregoing reasons given above with respect to claim 1, claims 10 and 15 are believed to be in condition for allowance.

CONCLUSION

For at least the reasons stated above, the Examiner's rejections of the pending claims are improper. Therefore, appellant respectfully requests that the Examiner's rejections be reversed.

If any issues remain, or if the Examiner or the Board has any further suggestions for expediting allowance of the present application, kindly contact the undersigned using the information provided below.

Respectfully submitted,



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APPENDIX A - CLAIMS

1. An apparatus comprising:

a substrate;

a voltage regulator converter, the voltage regulator converter comprising N (N>1) phases, each of the N phases located in a respective one of N areas of the substrate; and

a voltage regulator controller coupled to the voltage regulator converter,

wherein a first one of the N phases is to generate more heat than a second one of the N phases, and

wherein a first area of the substrate in which the first one of the N phases is located is less thermally-sensitive than a second area of the substrate in which the second one of the N phases is located.

2. An apparatus according to Claim 1, further comprising:

N feedback circuits, each of the N feedback circuits coupled to the voltage regulator controller and to one of the N phases, wherein one or more electrical elements of one of the N feedback circuits exhibits an electrical value that is different from an electrical value exhibited by a corresponding one or more electrical elements of another one of the N feedback circuits.

3. An apparatus according to Claim 2, wherein the one or more electrical elements of the one of the N feedback circuits comprises a first resistor, wherein the one or more electrical elements of the another one of the N feedback circuits comprises a second resistor, and wherein a resistance value associated with the first resistor is different from a resistance value associated with the second resistor.

4. An apparatus according to Claim 3, wherein the first resistor and the second resistor comprise current-sensing resistors.

5. An apparatus according to Claim 1, further comprising:

N feedback circuits, each of the N feedback circuits coupled to the voltage regulator controller and to one of the N phases,

wherein the voltage regulator controller is to sense a first sensed current value from a first of the N feedback circuits coupled to the first one of the N phases in response to a first current,

wherein the voltage regulator controller is to sense a second sensed current value from a second of the N feedback circuits coupled to the second one of the N phases in response to a second current, and

wherein the first sensed current value and the second sensed current value are substantially identical.

6. An apparatus according to Claim 5,

wherein the first of the N feedback circuits comprises a first current sensing resistor,

wherein the second of the N feedback circuits comprises a second current sensing resistor, and

wherein a resistance value associated with the first current sensing resistor is different from a resistance value associated with the second current sensing resistor.

7. An apparatus according to Claim 5, wherein the first current is less than the second current.

8. – 9. (Cancelled)

10. A method comprising:

controlling a first one of N phases of a voltage regulator converter to output a first current; and

controlling a second one of the N phases to output a second current,

wherein the first one of the N phases is to generate more heat than the second one of the N phases, and

wherein a first area of a substrate in which the first one of the N phases is located is less thermally-sensitive than the second area of the substrate in which the second one of the N phases is located.

11. A method according to Claim 10, further comprising:

sensing a third current from a first current sensing resistor of a first feedback circuit coupled to the first one of the N phases; and

sensing a fourth current from a second current sensing resistor of a second feedback circuit coupled to the second one of the N phases,

wherein the third current is substantially identical to the fourth current.

12. A method according to Claim 11,

wherein a resistance value associated with the first current sensing resistor is different from a resistance value associated with the second current sensing resistor.

13. A method according to Claim 10, wherein the third current is less than the fourth current.

14. (Cancelled)

15. A system comprising:

a microprocessor;

a motherboard coupled to the microprocessor;

a double data rate memory coupled to the microprocessor; and

a voltage regulator coupled to the motherboard to provide a voltage to the microprocessor, the voltage regulator comprising:

a voltage regulator converter, the voltage regulator converter comprising N (N>1) phases, each of the N phases located in a respective one of N areas of the substrate; and

a voltage regulator controller coupled to the voltage regulator converter,

wherein a first one of the N phases is to generate more heat than a second one of the N phases, and

wherein a first area of the substrate in which the first one of the N phases is located is less thermally-sensitive than a second area of the substrate in which the second one of the N phases is located.

16. A system according to Claim 15, further comprising:

N feedback circuits, each of the N feedback circuits coupled to the voltage regulator controller and to one of the N phases, wherein one or more electrical elements of one of the N feedback circuits exhibits an electrical value that is different from an electrical value exhibited by a corresponding one or more electrical elements of another one of the N feedback circuits.

17. A system according to Claim 16, wherein the one or more electrical elements of the one of the N feedback circuits comprises a first resistor, wherein the one or more electrical elements of the another one of the N feedback circuits comprises a second resistor, and wherein a resistance value associated with the first resistor is different from a resistance value associated with the second resistor.

18. A system according to Claim 15, further comprising:

N feedback circuits, each of the N feedback circuits coupled to the voltage regulator controller and to one of the N phases,

wherein the voltage regulator controller is to sense a first sensed current value from a first of the N feedback circuits coupled to the first one of the N phases in response to a first current,

wherein the voltage regulator controller is to sense a second sensed current value from a second of the N feedback circuits coupled to the second one of the N phases in response to a second current, and

wherein the first sensed current value and the second sensed current value are substantially identical.

19. A system according to Claim 18,

wherein the first of the N feedback circuits comprises a first current sensing resistor,

wherein the second of the N feedback circuits comprises a second current sensing resistor, and

wherein a resistance value associated with the first current sensing resistor is different from a resistance value associated with the second current sensing resistor.

20. – 21. (Cancelled)

APPENDIX B - EVIDENCE

No evidence is being submitted with this Appeal Brief (*i.e.*, this appendix is empty).

APPENDIX C - RELATED PROCEEDINGS

No prior or pending appeals, interferences, or judicial proceedings are known to Appellant, Appellant's legal representative, or assignee, which may be related to, directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal. Therefore, there are no copies of decisions rendered by a court or the Board to attach (*i.e.*, this appendix is empty).